

## A New Deep-Water Species of the Genus *Epilepton* (Bivalvia: Galeommatoidea) from the Atlantic

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**Abstract.** A new species of the genus *Epilepton* is described from the Atlantic. This is the first species of the genus to be described from abyssal depths. Described species of the genus that occur in the Atlantic are listed, and the relationship between *Epilepton* and *Neolepton* is discussed.

### INTRODUCTION

Species of the Galeommatoidea have been described mostly from shallow waters (e.g., Dall, 1899; Popham, 1940; Chavan, 1959; Boss, 1965; Ponder, 1971; Morton & Scott, 1989; Aartsen, 1996a and b; Salas & Gofas, 1998; Giribet & Peñas, 1998). Recent sampling by American research vessels in the Atlantic has shown that they also occur at abyssal depths (Allen, 2000) (see Allen & Sanders, 1996, for description of the extent of these studies). Many of the described species are either commensal or epiparasitic. The species described here is sub-trapezoidal in shape and resembles *Epilepton subtrigonum* (Jeffreys, 1875) from the West European Basin, and a Mediterranean species *Lepton solidulum* (Gaglioli, 1991).

The name *Epilepton* was introduced by Dall (1899) without explanation. *Epilepton*, together with *Neolepton* Monterosato, 1875, *Lutetina* Vélain, 1876, and *Planikellia* Cossmann, 1887, were listed by Dall (1899) as subgenera of *Lepton* in the family Leptonidae. Again, no reason was given for this. Later, *Epilepton* and *Neolepton* were included in the family Neoleptonidae by Theile (1935) and which he included within the Cyamacea. Thereafter, this arrangement was followed by most authorities (Bowden & Heppell, 1968) until recently, *Epilepton clarkiae* (Clark, 1852) and a new species of *Epilepton* (*E. parrussetensis* Giribet & Peñas, 1998) were included in the Montacutidae (Salas & Gofas, 1998). In transferring *Epilepton* to the Montacutidae Salas & Gofas (1998) followed Deroux (1961). Heppell (1964) and Bowden & Heppell (1968) had dismissed Deroux's opinion as fallacious. Nevertheless, the hinge and mantle of described species of *Epilepton* differ from those of *Neolepton* (see Salas & Gofas, 1998 and Allen, 2000) and are similar in most respects to montacutid species described by Popham (1940) and Morton & Scott (1989).

### Genus *Epilepton* Dall, 1899

Type species by monotypy: *Lepton clarkiae* Clark, 1852

Shell small (<3 mm total length), fragile, equivalve and somewhat compressed, inequilateral, anteriorly extended, ovate or subtrapezoidal, with maximum length ventral to mid-height giving a somewhat dorsally angulate appearance. White or pale fawn in colour, with fine irregular commarginal growth lines and, in some species, faint radial lines. Hinge plate with elongate anterior and posterior lateral teeth in each valve, single slightly oblique cardinal tooth anterior to umbo in each valve, the left cardinal usually smaller than right. Internal ligament, ventral and posterior to umbo, with a fine, barely visible external ligament present in some species. Anterior mantle margin of pedal aperture with sensory papillae.

The following Atlantic species are recognized:-

*Epilepton clarkiae* (Clark, 1852)

Figs. 1b & 5c

**Type locality:** Coralline zone off mid-south coast Devon, UK

**Type material:** Syntypes, U.S. National Museum 199440

*Lepton clarkiae* Clark, 1852: 191

*Epilepton clarkiae*, Dall, 1899: 876

*Epilepton clarkiae*, Tebble, 1966: 87, figures 41a–c

*Epilepton clarkiae*, Bowden & Heppell, 1968, 248, 266

*Epilepton clarkiae*, Nordsieck, 1969, 89, plate XIV, figure 50.70

*Lepton clarkiae*, Warén, 1983: 163, plate 8, figures 1 and 2

*Epilepton clarkiae*, Aartsen, Menkhorst & Gittenberger, 1984: 65, figure 330

*Epilepton clarkiae*, Aartsen, 1996: 32, 36, figure G

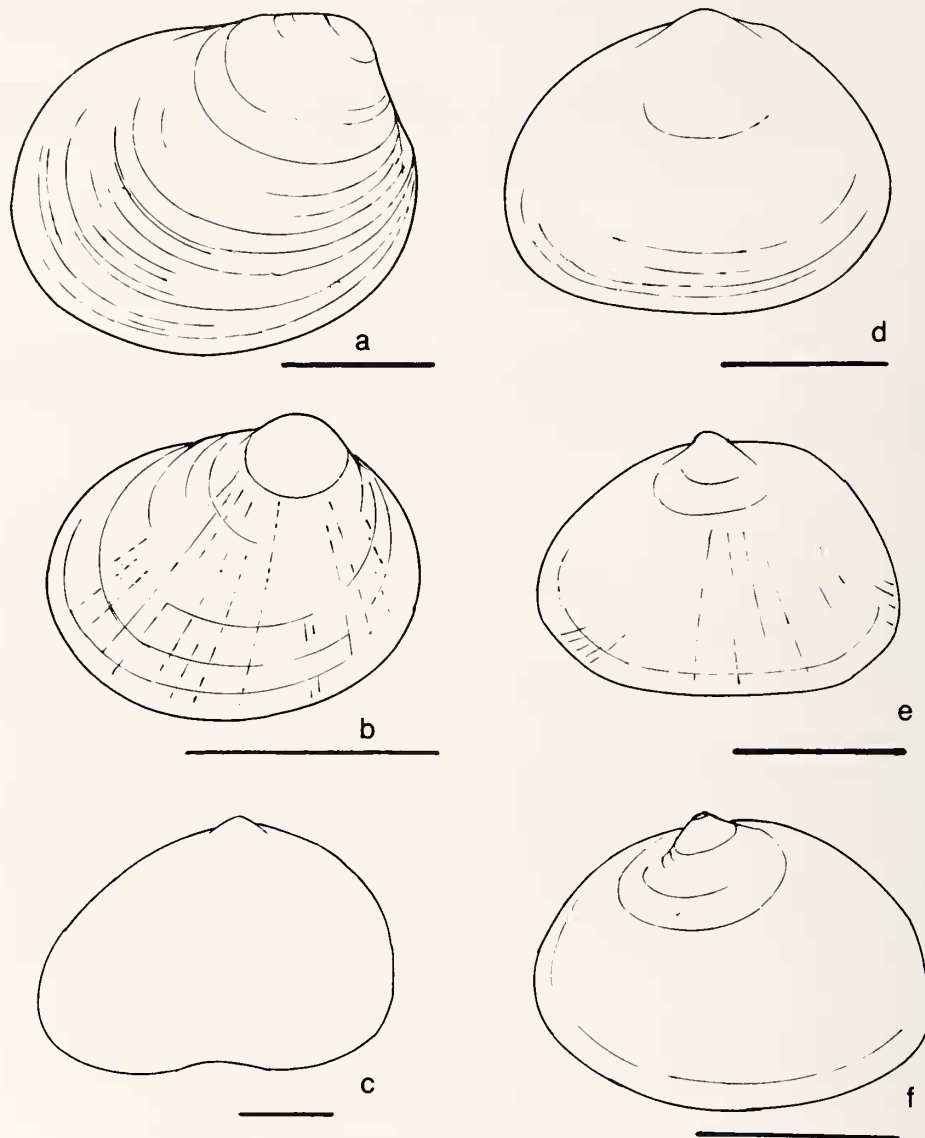


Figure 1. Species of *Epilepton*. Lateral views of the left valves of a, *E. parrussetensis*; b, *E. clarkiae*; c, "*Potidoma subtrigonum*"; d, *E. solidulum*; e, *E. elpis*; f, *E. subtrigonum*. Scale bars = 1 mm.

*Epilepton clarkiae*, Salas, 1996, 62

*Lepton clarkiae*, Salas & Gofas, 1998: 69

*Epilepton clarkiae*, Delongueville & Scaillet, 1999: 29

**Distribution:** Southwest European Basin and Mediterranean, upper shelf.

*Epilepton parrussetensis* Giribet & Peñas, 1998

Fig. 1a

**Type locality:** off Vallcarca (Sitges, Barcelona, 41°06'59"N 1°54'23"E), 250–350 m

**Type material:** Holotype, MNHN 15.07/4644. Paratypes, MNHN and BMNH

*Epilepton parrussetensis* Giribet & Peñas, 1998: 118, figures 1–4

**Distribution:** Northwest Mediterranean, from shelf to upper slope depths.

*Epilepton solidulum* (Gaglini, 1991)

Fig. 1d

**Type locality:** off Cape Palermo, 90 m

**Type material:** Holotype, Museo Civico di Zoologia di Roma

*Lepton solidulum*, Monterosato, 1875: 12

*Lepton solidulum*, Monterosato, 1878: 68

*Lepton solidulum* Gaglini, 1991: 176, figures 189 and 190

*Lepton solidulum*, Aartsen, 1996a: 34, figure F (left photograph)

**Distribution:** West European Basin and Mediterranean, from shelf to upper slope depths.

**Remarks:** Monterosato (1875, 1878) listed a considerable number of bivalve species, some of which he recorded as nov.sp., but without description. Recently, a number of his *nomina nuda* have been briefly described and figured by Gaglini (1991), thus making them available for the first time. Included is *Lepton solidulum* regarded by Gaglini (1991) as a valid species. This species was also doubtfully recorded by Aartsen (1996b) and photographed but wrongly identified by him as *Hemilepton nitidum* (Turton, 1822) (Aartsen, 1996a fig. F, left hand photograph). Although the shell is trapezoidal as compared the more ovate shape of *E. clarkiae* and *E. parrussetensis* (figure 1) the basic structure of the hinge is the same.

#### *Epilepton subtrigonum* (Fischer, 1873)

Figs 1f & 5a

**Type locality:** Fosse de Cape Breton, Biscay

**Type material:** Syntypes labelled *Lepton* n.sp.B of Biscay, Folin, U.S.National Museum 199475

**Cited specimen:** deposited in the Muséum d'Histoire Naturelle, Paris

*Lepton subtrigonum* Fischer, 1873, ex Jeffreys ms: 82, plate 2, figure 10

*Lepton subtrigonum*, Cerulli-Irelli, 1908: 2, plate 1, figures 5a and b

*Lepton subtrigonum*, Warén, 1980: 47

**Material:** Thalassa, station z425, 48°27.9'N 09°44.0'W, 700 m., 1 spec.

**Distribution:** Mid-slope depths in West European Basin.

**Shell description:** Very small <3 mm total length, subtrapezoidal (length/height ratio: 1/0.72), slender (length/width ratio: 1/0.41), equivalve, slightly inequilateral, umbo anterior to midline, white, translucent, almost invisible very fine, closely packed concentric striae, dorsal margin close to umbo almost straight and parallel to mid-ventral margin, antero-dorsal margin

oblique and shallowly curved, postero-dorsal margin more convex, both anterior and posterior shell limits ventral to mid-horizontal axis, mid-ventral margin almost straight or very slightly convex; umbos small, inwardly turned; hinge-plate broad, each valve with elongate posterior and anterior lateral teeth, small cardinal tooth in each valve; triangular internal ligament posterior to cardinal tooth, elongate opisthodontic submarginal external ligament hardly visible externally.

**Remarks:** As there is only one specimen in the present collection (Figure 1f) the anatomy is not described. The hinge features (Figure 5a) conform to those figured by Cerulli-Irelli (1908), as do the other shell features. The hinge is very similar to that of *E. clarkiae* Clark (Warén, 1983) (Figure 5c).

Deroux (1961) gave an extensive and comparative description of a shallow-water species commensal with the polychaete *Polydonte maxillosus* Ranzani, 1817, that he identified as "*Lepton subtrigonum* Jeffreys, 1873," and placed in a new genus *Potidoma*. He thought *Potidoma* was congeneric with *Epilepton clarkiae*, not noticing that his new genus would be a synonym of *Epilepton*.

The shell that Deroux (1961) describes has a heavy black or dark brown coating although the shell below is white and translucent. However, the mid-ventral margin of the shell Deroux described is not convex but concave and the position of the umbo and antero-dorsal shell margin differs considerably from the true *E. subtrigonum* and to previous accounts about it (Jeffreys, 1875; Cerulli-Irelli, 1908) (Figure 1f). The hinge also differs in its structure (Figure 5b) and, perhaps of less importance, is the much smaller size of the original and present specimens of *E. subtrigonum* as compared with those described by Deroux (1961). It should also be pointed out that there is a very great difference in their depths of occurrence. The species described by Deroux may well be an *Epilepton*, it is doubtful whether it is identical to the *E. subtrigonum* that Fischer (1873) described.

#### *Epilepton elpis* n.sp.

Figs 1e, 2, 3, 4 & 6

**Type locality:** North America Basin, 35°50.0'N 64°57.5'W, 4833 m

**Type specimen:** Holotype and paratype, Natural History Museum, London

**Material:** Atlantis II 24, station 121, 35°50.0'N 65°11.0'W, 4800 m., 1; station 122, 35°50.0'N 64°57.5'W, 4833 m., 5 spec.

**Distribution:** Abyssal depths in the North America Basin.

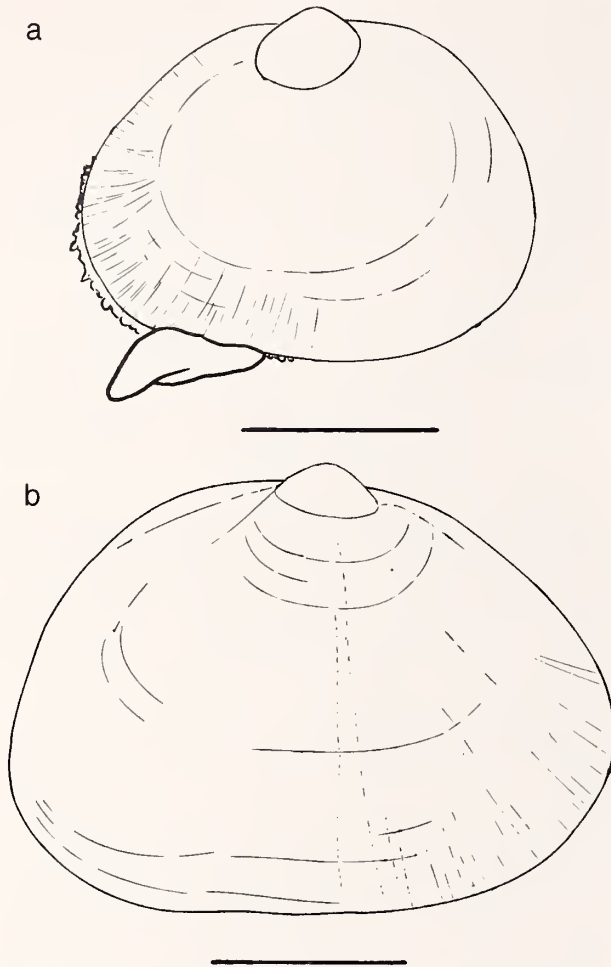


Figure 2. *Epilepton elpis* a) lateral view of shell (Station 122) from left side showing protruding foot and sensory papillae of anterior pedal margin; b) lateral view of shell (Station 121) from right side. Scale bars = 1 mm.

**Shell description:** Small (<6.5 mm in length), somewhat triangular (sub-trapezoidal) with maximum shell length markedly ventral to mid-horizontal line, elongate (length/height ratio: 1/0.75), slender (length/width ratio: 1/0.29), extremely fragile, white, in some specimens faint anterior marginal radial ridges correspond to region of sensory mantle tentacles, few faint growth lines present; umbo moderately prominent, slightly anterior to the mid-vertical line; shell margin highly characteristic, postero-dorsal margin relatively straight for short distance before broadly curving to the posterior limit of shell, antero-dorsal margin slopes steeply and relatively straight to approximately the mid-horizontal line before curving to anterior limit of shell and continuing to ventral margin; ventral margin in most specimens shallowly curved, in others almost straight or even slightly concave posterior to mid-

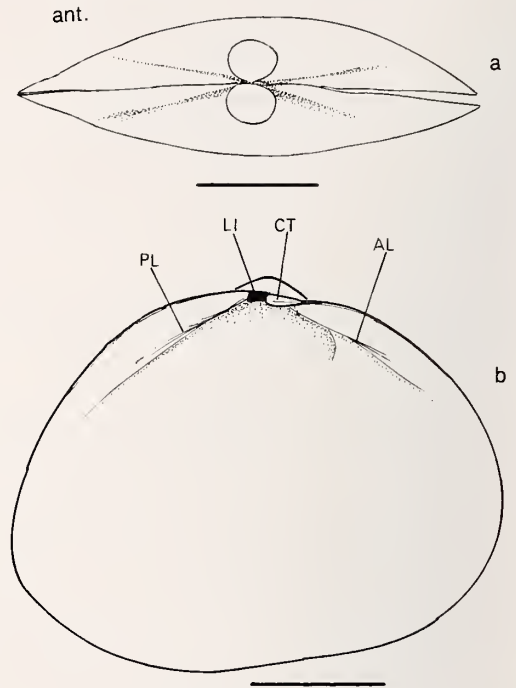


Figure 3. *Epilepton elpis* a, internal view of a left valve (station 121) to show detail of hinge; dorsal view of shell (station 121). Scale bars 1 mm. AL anterior lateral tooth, CT cardinal tooth, LI ligament, PL posterior lateral tooth.

vertical line; hinge-plate elongate, posteriorly broad, less so anteriorly, anterior and posterior lateral teeth at ventral margin of the hinge-plate slender, single posteriorly oblique cardinal tooth in each valve, meets shell margin immediately posterior to beak; internal ligament short and opisthodontic, lies close to margin of hinge-plate posterior to cardinal tooth, internal and external layers clearly marked, posterior external ligament of fused periostracum short, very small anterior external ligament present; prodissococonch extremely large, 1.04 mm total length.

**Internal morphology:** Anterior sensory fold of mantle margin of pedal aperture finely papillate (28 papillae on each mantle edge in a specimen 4 mm. total length), a moderately broad band of mantle glands lie immediately internal to inner muscular fold of pedal aperture and dorsally delineated by an irregular epithelial ridge, sensory folds posterior to the pedal gape with eight papillae, simple posterior exhalant and 'inhalant' apertures the former formed by mantle fusion the latter by adhesion of the opposing inner mantle folds; anterior and posterior adductor muscles circular in cross section, posterior adductor slightly larger than anterior; foot relatively large and broad; posterior and anterior retractor muscles well-developed; pedal glands present with 5-6 byssal threads; gills



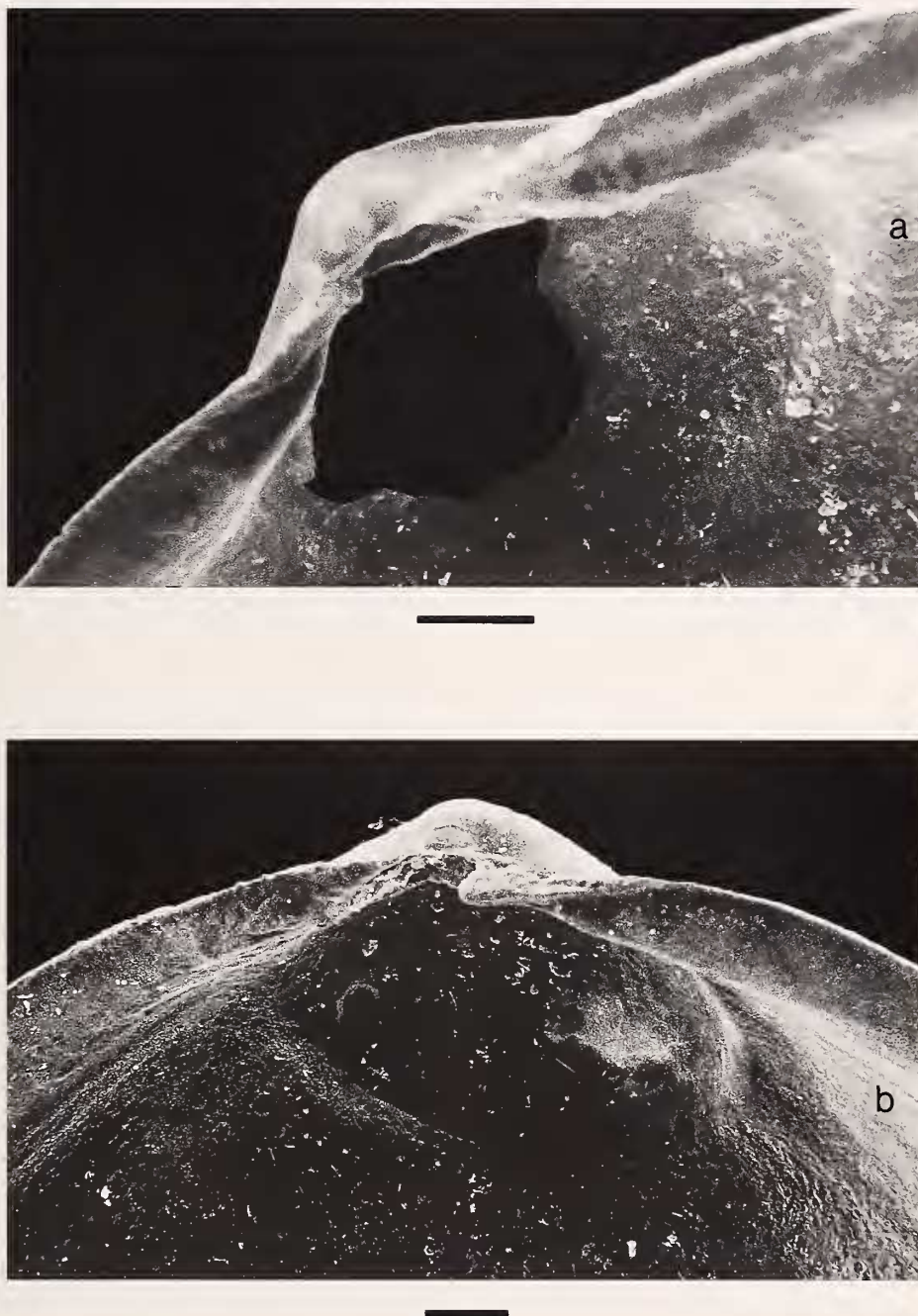


Figure 4. *Epilepton elpis* a and b) Internal views of the hinge of the right and left valves (station 122) to show detail of the hinge. Scale bars = 0.1 mm.

homorhabdic, not plicate, outer demibranch absent, inner demibranch with ascending and descending lamellae composed of approximately 35 filaments, ventral groove of demibranch not marked, axes of ascending lamellae fused to body wall and to each other

posterior to foot; palps small with approximately 8 internal ridges; mouth opens to relatively elongate oesophagus, stomach elongate with midgut and style sac combined, hindgut extends anteriorly for a short distance before turning posteriorly along the dorsal

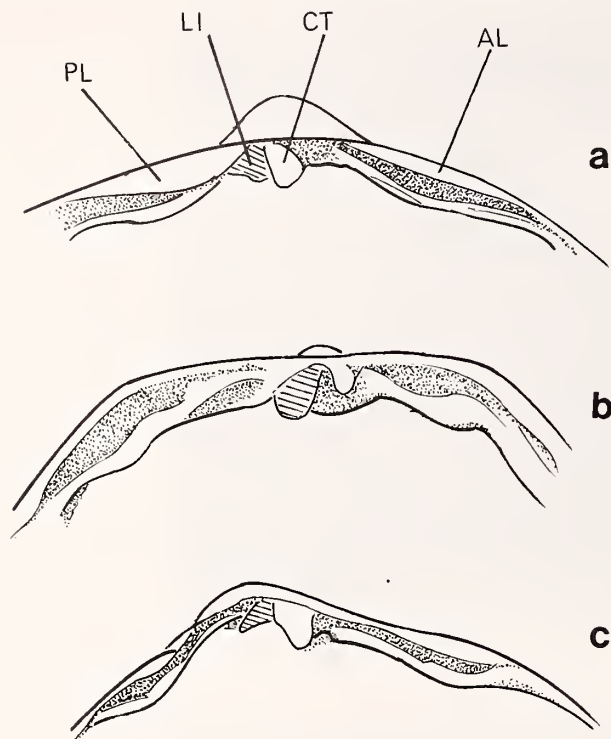


Figure 5. Species of *Epilepton*. Semidiagrammatic illustrations of the left hinges of a, *E. subtrigomum*; b, "*Potidoma subtrigomum*" (after Deroux, 1961); c, *E. clarkiae* (after Tebble, 1966). AL anterior lateral tooth, CT cardinal tooth, LI ligament, PL posterior lateral tooth.

margin to pass over posterior adductor to anus; visceral, cerebral and pedal ganglia small, with very fine connectives: gonad immature in stained specimen.

**Remarks:** This species is named after Elpis (Hope) the only item left in Pandora's box after she had opened it. It is a truly abyssal species. It differs from *E. clarkiae*, *E. Parrussetensis*, *E. solidulum* and *E. subtrigomum*, in shell proportions (Figure 1), in differences in the position of the umbo in relation to the length of the shell, the less curved ventral margin, the less prominent lateral teeth and the more oblique ligament and relatively weak cardinal tooth.

## DISCUSSION

In addition to the five species listed above, a further three Atlantic species may belong to the genus. One, described under the name *Mancikellia divae* by Aartsen and Carrozza (1997), is considered to be a species of *Epilepton* by Giribet & Peñas (1998). A second, already discussed (p. 2), is that described by Deroux (1961) as "*Potidoma subtrigomum*." A possible third discovered when searching relevant literature was described and named by Dall (1899) as *Erycina? fernandina*. As recognised by Abbott (1974), this does not belong to

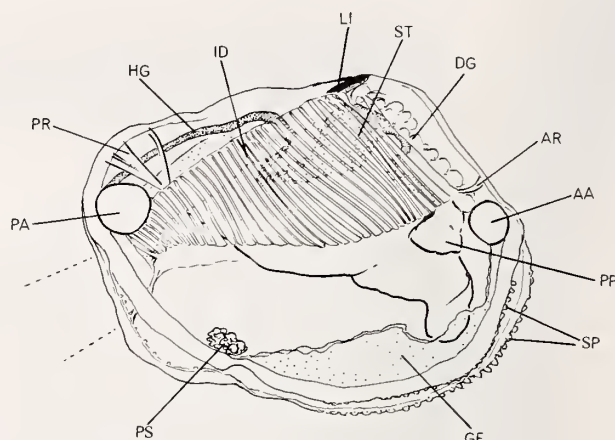


Figure 6. *Epilepton elpis* Semidiagrammatic view of the internal anatomy of a specimen from Station 122 as seen from the right side. AA anterior adductor, AR anterior pedal retractor, DG digestive gland, FT foot, GE glandular epithelium, HG hindgut, ID inner demibranch, LI ligament, PA posterior adductor, PP palp, PR posterior pedal retractor, PS pseudofaeces, SP sensory mantle papillae, ST stomach. Scale bar = 1 mm.

the genus *Erycina* but may, on further examination, prove to be an *Epilepton*.

Bivalves of the order Galeommatoidea are notoriously difficult to identify and there has been considerable debate as to their relationships with other orders. Salas & Gofas (1998), in particular, have suggested that *Neolepton* is a paedomorphic veneroidean. Certainly the hinge characters of *Neolepton* suggest this could be so (Allen, 2000). In contrast, the hinge of *Epilepton* differs considerably from that of *Neolepton* and the veneroideans. Although, like *Neolepton*, *Epilepton* has elongate posterior and anterior lateral hinge teeth instead of a complex series of cardinal teeth, *Epilepton* has a single cardinal that may or may not be particularly strong. There is a strong case for removing *Epilepton* from the Neoleptonidae. A transfer to the Montacutidae was suggested by Deroux (1961), debated by Bowden & Heppell (1968), and concurred by Salas & Gofas (1998). Unlike *Neolepton*, *Epilepton* has no exhalant siphon. Furthermore, *Epilepton* has sensory papillae at the mantle edge of the pedal aperture (Figure 7), a feature not present in *Neolepton*.

The new species described here differs in one respect from described species of the family Montacutidae. In the two specimens in which the soft parts were examined an 'inhalant' aperture was defined by a short adhesion of the opposite inner muscular folds of the mantle. Apart from this the mantle margin is similar to other species of the family Montacutidae, i.e., a papillate sensory fold with the papillae particularly numerous anteriorly, and an exhalant aperture that is not



siphonate. It is likely that in *E. elpis* water flow into the mantle cavity is via the anterior papillate area of the mantle gape and that the posterior 'inhalent' aperture is the point at which the pseudofaeces are voided.

*Epilepton clarkiae* and *E. parrussetensis* are more ovate and anteriorly extended than the other species listed here. Nevertheless, the hinge structure is similar (Figure 5), and where described, so too is the internal anatomy. At present, there is no reason for them to be separate genera. The sub-trapezoidal shape and the shallowly curved ventral shell margin, which in the case of *E. elpis* maybe slightly concave mid-ventrally, is reminiscent of the genus *Pseudopythina* and may indicate similarity in habit. Species of *Pseudopythina* are commensals that are typically byssally attached to other species [e.g., *P. rugifera* (Carpenter, 1864) attached to *Upogebia pugettensis* (Dana, 1852), Narchi (1963)]. In fact, *Epilepton clarkiae*, although not of this shape, has recently been proved to be commensal with *Phascolion stromi* (Delongueville & Scaillet, 1999). However, the hinge of *Pseudopythina* is without anterior and posterior lateral teeth, and it must be assumed that the similarity in shape with *E. elpis* may be related to the epibyssate habit of the two genera.

Apart from the reduction of the ctenidia to single inner demibranchs as seen in *E. elpis*, there is little deviation from the typical eulamellibranch anatomy. Reduction of the ctenidia is almost universal in deep-sea bivalves, particularly those of a small size. This may simply be related to small size, although respiratory demands probably differ at great depths due the effect of pressure on physiological processes.

**Acknowledgments.** I would like to thank Lorraine Fraser for assistance with the SEM photographs. I would also like to thank the unknown reviewers who provided valuable suggestions as to the improvement of the manuscript.

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